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ABSTRACT

The first goal of this research project was to demonstrate the use of computer assisted video instruction (CAVI) for teaching mildly handicapped students school to community transition skills. Two CAVI learning modules were developed on asking for help and budgeting. The first includes eight lessons focusing on questions of why, when, who, what, and how. Students have five different types of possible response modes: (1) answer sheets, (2) keyboard decision, (3) discussion, (4) verbal rehearsal, and (5) behavioral rehearsal. The second module was tutorial in nature and was based on items selected from the Social and Prevocational Information Test. The second goal of the project was to evaluate the two modules. Studies undertaken to determine the effects of different types of informational feedback on learning performance and the effectiveness of the Asking for Help Curriculum are described. The third goal of the project was to increase the utility of CAVI through products such as the Interactive Video Development Manual, sample pages of which are reproduced in this document. (CL)

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Final Report

A New Instructional Technology to Enhance Transition from School to Community for Mildly Handicapped Individuals

"A New Instructional Technology to Enhance Transition from School to Community for Mildly Handicapped Individuals"

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The expansion of microcomputers has been so rapid within the past few years that it is often referred to as a revolution. Furthermore, there is no question but that handicapped people have already been significantly aided by the onset of microcomputers; however, we have only begun to explore this potential (Aylor, Johnson, & Ramey, 1981). The implications of this new technological era are far reaching. Leneway and Montgomery (1981), for example, note that, "The lives of many handicapped persons have been vastly improved by computer technology . . . but millions wait to be served" (p. 49).

One of the more promising uses of microcomputers is Interactive Video or Computer Assisted Video Instruction (CAVI). CAVI is a new technology currently recognized in both education and industry as a powerful teaching/training method to improve learning. Furthermore, with the rapidly expanding presence of microcomputers and video equipment in all facets of American life, many educators consider CAVI on the verge of becoming the "instructional technology" of the 1980s. In essence, CAVI is a merging of video presentations into computer assisted instruction (CAI) which has been defined as " . . . an interactive learning environment in which the computer presents and responds to information given to it by the learner for the purpose of facilitating performance on the part of the learner" (Winters, Hoots, & East, 1978, p. 4).

GOALS AND OBJECTIVES

The purpose of this research project was to demonstrate the utility of computer assisted video instruction for teaching mildly handicapped students

important skills for successful transition from school to community. Specifically, the three project goals were to: (1) develop CAVI modules on two transitional living content areas, (2) evaluate the effectiveness of the CAVI modules based upon improvement in student performance, and (3) prepare and disseminate products to further enhance the utility of this instructional technology for teaching transitional living skills. The 12 project objectives are subsumed under these three goals.

Goal 1: Develop CAVI modules on two transitional living content areas.

Objective 1: Form an advisory task force of secondary level special education teachers, adult handicapped service providers, and concerned parents.

Objective 2: Select two transitional living content areas.

Objective 3: Develop the general design of the CAVI modules, including the desired learning objectives, remedial branching, amount of program interactivity, type and frequency of feedback, etc.

Objective 4: Develop the video and computer program components and combine together to make the CAVI modules.

Goal 2: Evaluate the effectiveness of the two transitional living CAVI modules.

Objective 5: Define student selection criteria and develop cooperative work arrangements with schools and/or other educational programs.

Objective 6: Pilot test the two transitional living CAVI modules on a small sample of students to allow for identification and correction of instructional and technical problems.

Objective 7: Schedule and administer the pretesting, instruction, and posttesting of students on the two finalized transitional living CAVI modules.

Objective 8: Analyze data according to the research design to determine the effects on student performance which is attributable to CAVI training.

Objective 9: Evaluate the specific CAVI modules to include strengths, weaknesses, and areas requiring further research for instructional refinement.

Goal 3: Prepare and disseminate several project-related products.

Objective 10: Produce a CAVI Users Development Manual to provide guidelines and suggestions for preparing quality CAVI courseware for mildly handicapped adolescents/young adults.

Objective 11: Produce a professional manuscript(s) for publication to highlight relevant project activities and findings and present one or more formal papers on project activities and findings at professional meetings.

Objective 12: Make the two transitional living CAVI modules available to interested users for further research.

Figure 1 displays the time/task analysis that was used for implementing these goals and their related project objectives.

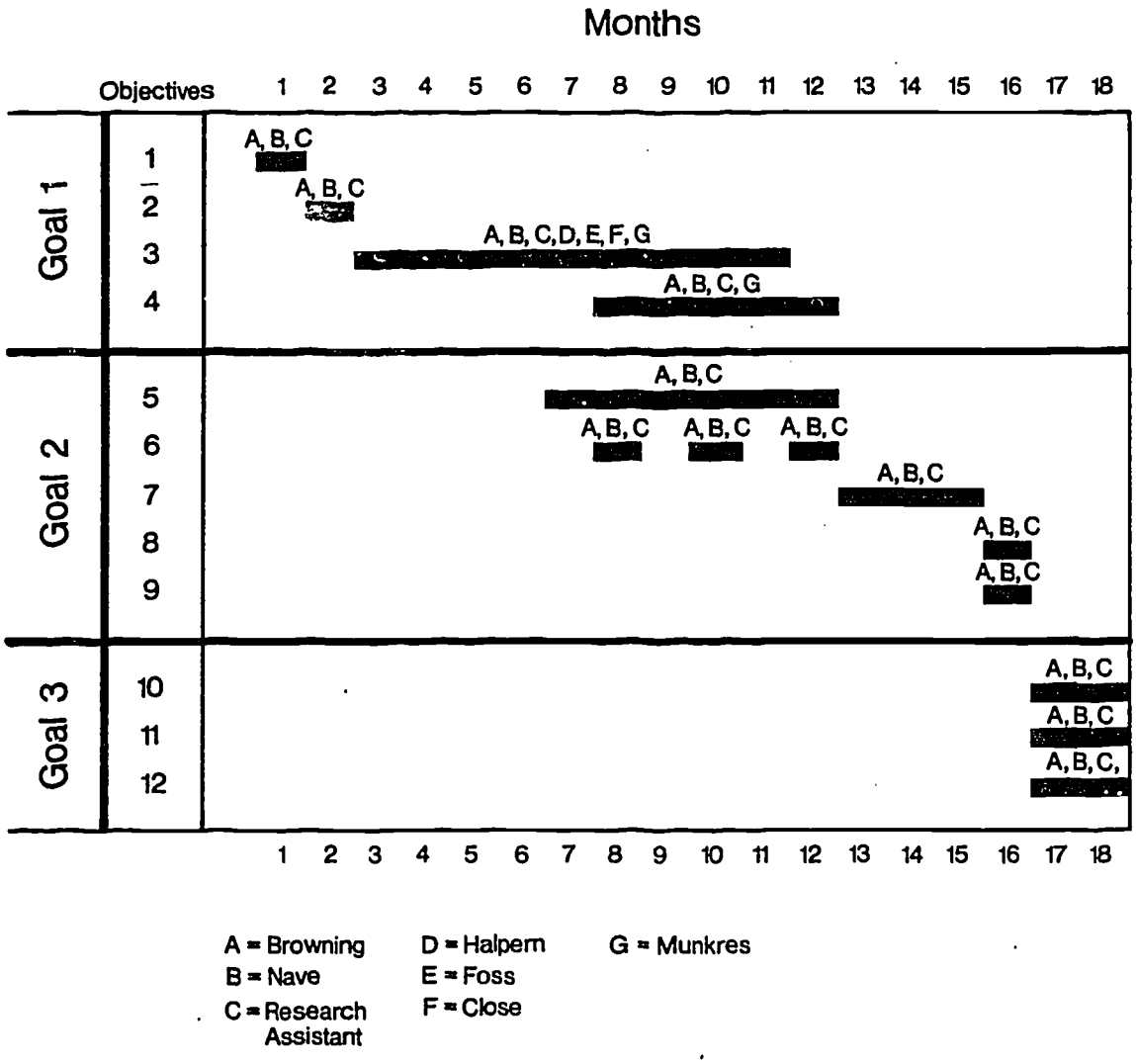

Figure 1: Time/Task Analysis

Results

Goal 1: Develop CAVI modules on two transitional living content areas.

Objective 1. The Rehabilitation Research and Training Center's Advisory Committee was utilized to meet this objective. Special educators, service delivery personnel for the handicapped, and parents of the handicapped are represented on this committee. During the course of the Project, the Advisory Committee met twice and served as a guiding resource for the Project. Furthermore, select members were contacted from time to time in order to obtain their input with respect to Project considerations. The names, positions, and addresses of the Advisory Committee are presented below:

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Objectives 2, 3, and 4. The content domains of the two CAVI learning modules were "Asking for Help" and "Budgeting." The remainder of this Objectives section will highlight the nature of these two interactive video curriculums. In addition, the system used to operate the interactive video courseware is briefly described.

CAVI Module #1

The simplest way to convey the nature and importance of the first module, Asking for Help, is to present a brief case study. When we began developing this curriculum, several acquaintances were sought out and asked to keep a daily record of the times in which "asking for help" entered their daily experiences. What follows is that which was recorded by one individual over three consecutive days:

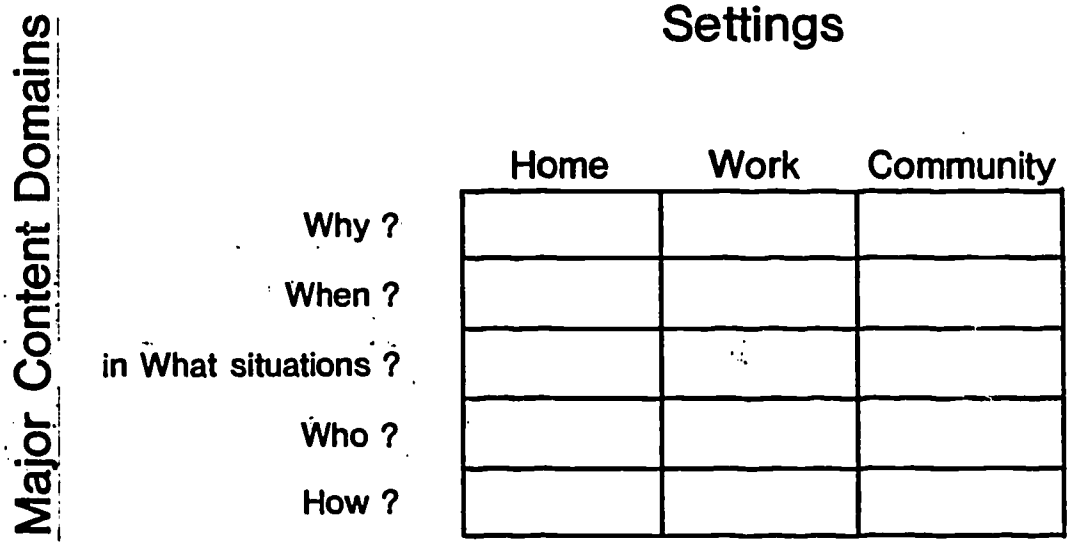
> Monday: Morning started bad--got in car to go to work and car battery was dead--called tow truck service--knew I'd be late for work and had 8:00 a.m. appointment--called Bill (fellow worker) and asked him to fill in for me--wife called me at work in afternoon and asked me to get my daughter a prescription on way home--she got sick in school--son asked me to help him with homework that evening.
>
> Tuesday: Had to ask John (boss) for clarification on job assignment--shortly afterwards an employee under me asked me for help on how to transact forms--asked for directions on how to find location of potential client--secretary's word processor messed up; asked for maintenance help--stopped by grocery store on way home to pick up list of items; couldn't find two of them; asked store clerk for help--asked son to help me clean out shed that evening.
>
> Wednesday: Wife called me at work and said stove didn't work; called appliance service--planned to take wife to movies; asked friends at work if any good ones were playing--met again with potential client who just moved to town; he asked me about medical services (e.g., family doc-

tor, dentist, etc.)--wife asked me to help rearrange furniture.

You have just gotten a glimpse of how "asking for help" was a part of one person's experience for three consecutive days. Nearly all of us would turn up similar profiles if we kept a diary on the times we asked or were asked for help in our daily lives. We all ask for help nearly every day because it is indeed a smart thing to do. Asking for help represents a life enhancement skill area that serves to contribute to or enhance our <u>inter-dependence</u>.

Asking for help is not as simple as it first seems. For example, many situational nuances are involved in decisions about when, who, and how to ask for help. The breadth of asking for help as a subject area is delineated in question format on the following page. This outline provides a conceptual framework for the entire curriculum.

The need or desire to ask for help can occur in numerous settings and situations. The following model displays how three major settings, (home, work, and community) are represented throughout the eight interactive video lessons on Asking for Help.



A CONCEPTUAL FRAMEWORK

Why?

- People should ask for help because it is smart to ask for help. In fact, most people ask for help often.
- It is smart to ask for help because it is often necessary and even when it is not necessary it is often helpful.

When?

- It is smart to ask for help when:
  - . . . the problem is important.
  - . . . you are in a hurry.
  - . . . it is convenient.
  - . . . the problem continues to get worse.
  - . . . you are in trouble.

Who?

- Some of the most important people to ask for help are:
  - . . . people you feel close to.
  - . . . people paid to help.
  - . . . people who are emergency helpers.
  - . . . yourself.

What?

- Some of the different times in which you might ask for help are:
  - . . . when you are upset.
  - . . . when you are sick or hurt.
  - . . . when you go shopping.
  - . . . when you are at home.
  - . . . when you are at work.
  - . . . when you want to have fun.

How?

- Four important steps in how to ask for help are:
  - . . . get the person's attention.
  - . . . ask the person for help.
  - . . . keep asking the person until you get all the help you need.
  - . . . thank the person.

Furthermore, a variety of situations in which it is appropriate to ask for help is depicted within these different settings. In total, 58 video scenarios and 98 slides are used throughout the eight lessons to depict the major settings and their respective varying situations. In Lesson 1 alone, the students are visually exposed through video to the following mix of situations:

-- needing directions in the community.
-- suffering a cut from a broken bottle in the park.
-- being laid off a job.
-- having an unmanageable amount of work to do at the office.
-- the refrigerator at home breaking down.
-- figuring out the proper shirt size at a clothing store.
-- obtaining medical help for a sick friend.
-- figuring out how to do a job at work.
-- obtaining bus schedule information.
-- house in community on fire.
-- looking for a job.
-- breaking arm in bicycle accident.
-- trying to locate a particular store.
-- finding out about recreation center activities.
-- unable to move big table by oneself.
-- checking whether a particular bus is the proper one to ride.
-- asking the boss how to do a task at work.
-- car running out of gas.
-- finding out which movies are playing.

The focus of the curriculum refers to five major domains, distributed over eight lessons. The focus or content domain of each lesson is presented below:

LESSON 1: Why should you ask for help?

LESSON 2: When should you ask for help?

LESSON 3: When should you ask for help?

LESSON 4: Who should ask for help?

LESSON 5: In what situations should you ask for help (upset or sick or hurt)?

LESSON 6: In what situations should you ask for help (shopping and home)?

LESSON 7: In what situations should you ask for help (work and leisure)?

LESSON 8: How should you ask for help?

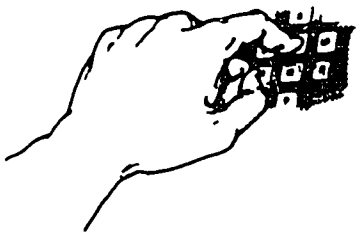
The learning points in the curriculum refer to the "guidelines" or "rules" of the lessons to be taught the students. There are a total of 49 learning points covered in the eight lessons. The teacher has considerable flexibility in deciding whether to emphasize all or only some of them.

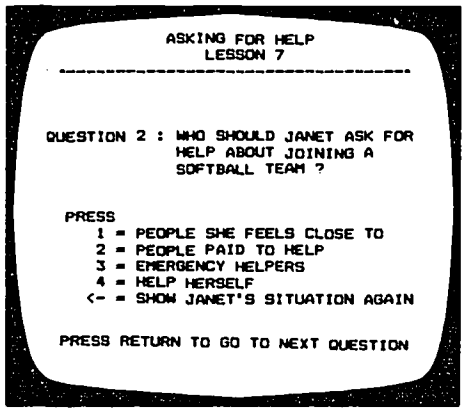
Interactive opportunities refer to the different types of possible student responses that have been designed into the lessons. These different response modes allow the students opportunities for "active" learning. The five types of responses are (1) answer sheet, (2) keyboard decision, (3) discussion, (4) verbal rehearsal, and (5) behavioral rehearsal. For the purpose of this final report, only the "keyboard decision" as a type of interaction is discussed. The computer keyboard provides the most important type of interactive opportunity for this approach to learning. "Interactive Video" is made possible by pressing certain keys on the computer keyboard. In other words, different things happen depending on which keys are pressed.

A major way in which teachers use the keyboard to interact with the video is what we have labeled keyboard decision. This type of interactive opportunity occurs when the videotape has presented a problem situation and/or a forced-choice question. The keys "1" and "2" (or sometimes "1," "2," "3," and "4") represent different multiple-choice answers to the question (e.g., press "1" if you think the statement is true; press "2" if you think the statement is false). The tape is driven to different feedback

frames depending on which keys are pressed. Each time a keyboard decision is required, the following symbol appears at the corresponding point in the teacher's manual. Furthermore, the words that appear on the TV monitor screen in the symbol are identical to those words that appear on the actual TV monitor during the lessons.

Keyboard Decision





There are a minimum of 29 keyboard decisions for eight lessons. This number can actually be increased to 67 if all options are selected for each problem situation. For instance, students may choose between four answers to a given problem situation. But even after one of the answers is selected, students later will have the opportunity to try each of the other three answers also, if they so choose.

There are also a number of other ways the teacher can use the keyboard to interact with the video. These include: pressing the "Return" key to continue after a pause for discussion in the lesson; pressing the "<-" key to repeat the previously viewed problem situation; pressing both the "Control" and the "S" keys together, or pressing both the "Control" and the "P"

keys to stop or pause the videotape at any time. All of these keyboard functions are quite easy to use.

CAVI Module #2

The second learning module was on "budgeting." Unlike the first module, which was simulation learning, this curriculum was tutorial in nature.

Two pieces of video software were developed. The first was a computer interactive videotape designed for teaching the users how to manage the hardware and operate the software. Specifically, it was designed to teach the subjects how to input responses to target questions administered verbally, within a specified time period. To participate in the study using this CAVI module, subjects were required to locate and press the "Y" key to input a "yes" response and the "N" key to input a "no" response. A limit of 10 seconds was established for responding. The nature of computerized instruction necessitates setting a time limit in that the computer, being a very patient "teacher," will wait indefinitely for user input. This length of time (10 seconds) was chosen for the following reason: it was felt that mentally selecting an answer and locating the appropriate input key would be a difficult, time-consuming task; however, allowing time beyond 10 seconds might result in forgetting the question to which the subject was to respond. Ten seconds also seemed appropriate to assure that all subjects had the opportunity to decide on an answer, locate the target key, and respond. Students unable to learn to interact with the computer in this manner during the orientation were to be eliminated from the study.

There were three ways in which students could fail to respond appropriately. They included (1) responding before the computer was prepared to accept input, (2) responding after 10 seconds, and (3) inputting a response other than "Y" or "N." Observational data was collected during each orientation session to determine the frequency with which each of the above inappropriate responses occurred.

The following is an excerpt of the script upon which the "orientation" videotape was developed:

Scene 1

(Pic. 1) Hi. Soon, we will begin a lesson on using the computer. So before we begin the lesson, we'll show you some things about how to use the computer. It's easier than you might think.

(Pic. 2) This is a keyboard.

(Pic. 3) On the keys are the letters of the alphabet.

The only keys you have to press are the "Y" key and the "N" key.

(Pic. 4) "Y" stands for yes, so we'll call it the Yes key.

(Pic. 5) "N" stands for no, so we'll call it the No key.
(Pic. 1) We'll be asking you some questions. Whenever you want to answer yes, press the Yes key and whenever you want to answer no, press the No key.

Before you start answering questions, let's first see how Ralph does it.

(Pic. 6) This is Ralph, a student who's trying to learn how to use the computer. Here's what happens when Ralph answers a question right:

Notice how carefully Ralph is paying attention to the screen. (Computer screen flashes moving picture of children playing football and asks, "These people are playing one of the most popular games in America. Question: Are they playing

baseball? Yes or No? Again. Are they playing baseball? Press Yes or No. [Bell]"). Notice that Ralph waits until after the bell before he tries to answer. If he tries to answer before the bell, his answer won't count. Ralph is pressing the "N" key for No. Now he has to wait for the computer to tell him if he's right or wrong. The computer can be pretty slow so Ralph has to wait a pretty long time. Let's see what happens. (Announcer on computer says, "Correct! You're absolutely right. They're not playing baseball. They're playing football. Nice job.)

Now let's see what would happen if Ralph answered that question wrong. (Ralph is not paying careful attention to the screen.) (Computer screen flashes moving picture of children playing football and asks, "These people are playing one of the most popular games in America. Question: Are they playing baseball? Yes or No. They are not playing baseball. Instead, they're playing football.") Ralph pressed Yes but the answer was No.

(Pic. 1) So by listening to the computer, you can tell if your answer was right or wrong. When you're using the computer, there are lots of different ways you can answer wrong, so be careful. We saw one way already, when the answer was No but Ralph pressed Yes. Here are some other ways that Ralph could have answered wrong:

The second related software to "budgeting" was the curriculum itself. The educational program was based on the 10 true/false items selected from the budget subtest of the Social and Prevocational Information Test and transformed into yes/no questions. Selection of the 10 items was based on two factors: (1) ease of transformation to an interrogative form, and (2) difficulty level of the item. In reference to difficulty, items were selected so that the reported difficulty for high school special education students passing the items ranged from 53% to 90%. This particular range was selected to eliminate extreme scores at either end of the difficulty continuum. Beyond this range the potential existed for subjects to either "know" correct responses prior to treatment or to experience repeated fail-

ure because item difficulty was too great. Either case would mask treatment effectiveness unnecessarily.

Each of the 10 items was presented via videotape. Following the presentation of each item, the learner indicated through the computer whether s/he agreed (yes/no) with it. The computer evaluated the correctness of each response. Subsequent to each incorrect response, the learner was introduced through videotaped segments to one or more of several types of informational corrective feedback. It was this feedback aspect of the curriculum which differed for the two groups.

The concept of feedback consists of four structural elements (i.e., function, schedule, timing, and type). It was this latter element that served as the independent variable or treatment condition for this study. Again, type of feedback referred to the nature of the message or corrective information given to the subject following his/her response.

The educational software for Group A incorporated two types of error corrective information. Each of these types is described below:

Type I: This type of informational feedback for Group A first informed subjects when they incorrectly answer a yes/no item, restated the yes/no item in its correct form, and then provided a "brief explanation" of why the correct answer was so. An example of this type of information is presented below.

> Question: Is it always possible to spend your money exactly the way you planned?
>
> Student Answer: Yes.
>
> Feedback: Wrong. It is not always possible to spend your money exactly the way you planned. You might have made a very good plan about how to spend your money but still something might come up that you didn't expect to happen, like your TV might stop working and need to be fixed. So then you would change your plan about how to spend your money.

Type II: This type of informational feedback was for subjects in Group A who failed to learn from Type I. Type II, like Type I, also informed subjects when they incorrectly answer a yes/no item and restated the yes/no item in its correct form. However, it then provided (1) a formal rule to apply to the item, (2) a story form example related to a hypothetical situation, (3) a yes/no question about what would happen in the example, (4) the correct answer to that yes/no question, and (5) a restatement and correct answer to the original question. An example of this is presented below.

> Question: Is it always possible to spend your money exactly the way you planned?
>
> Student Answer: Yes.
>
> Feedback: Wrong. It is not always possible to spend your money exactly the way you planned. Here's a rule to remember: Even when you have a good plan for spending your money, it's okay to change your plan when something really important comes up that you didn't expect. Listen. Sally is planning to spend her extra money on a record album. But, Sally gets a really bad case of poison ivy. It really itches. Sally has to decide . . . to spend her money on the record album or on some ointment that would make the poison ivy itch less.
> Should Sally spend her extra money on the ointment? Yes. Why? Because something really important came up that Sally didn't expect. She needs the ointment right away to relieve her pain and itching, but she can buy a record album sometime later.
>
> Here's the question again. is it always possible to spend your money exactly the way you planned? (Pause) No.

The educational software for Group B incorporated another type (referred to as Type III) of error corrective information. Both a definition and example of this type is presented below.

Type III: This type of informational feedback for Group B informed subjects when they incorrectly answer a yes/no item and then restated the yes/no item in its correct form.

> Question: Is it always possible to spend your money exactly the way you planned?
>
> Student Answer: Yes.
>
> Feedback: Wrong. It is not always possible to spend your money exactly the way you planned..

Again, the computer evaluated the correctness of responding, provided appropriate feedback, and scored the item. Criterion performance was established at two consecutive correct responses per item. A ceiling of three errors per item was also set. A reiterative process was employed. In other words, all 10 items were administered and scored prior to repetition of any items. There were two complete iterations of the 10 items; subsequently, only those items answered incorrectly on the previous iteration or previously correct items not yet at the criterion level were repeated.

In summary, the subjects in both Groups A and B received the same 10 true/false budget items. Furthermore, the educational software was designed so that the structural feedback elements of function, schedule, and timing were constant for both groups. The difference between the groups was in the nature of the corrective information feedback and herein was the focus of this study.

The CAVI System

The CAVI system for the two learning modules consisted of: (1) a microcomputer, (2) a videotape recorder (VTR), (3) a computer-video player interface card, and (4) a video monitor. These four components, when properly connected, allowed the user to run CAVI software (i.e., the two learning modules). This software consisted of a computer program and associated videotape.

The computer used in this project was an Apple II+ microcomputer with 64K bytes of random access memory and two floppy disk drives. The VTR used

was a Panasonic NV-8200 1/2" industrial model and the interface card was a BCD 450 purchased from BCD Associates in Oklahoma City, Oklahoma.

With respect to the second learning module on "Budgeting," a learning station was designed and built to provide an efficient learning environment for students to interact with the CAVI system. The Apple II+ and a color TV monitor were placed in front of the student inside the station. The tape recorder was placed out of sight on a fold-out table secured to the back of the learning station. This minimized the amount of visible equipment and helped to muffle the operating noise of the VTR.

Each student worked individually at the learning station, which was set up in a room separate from the classroom to minimize distractions. A teaching facilitator was present during student learning sessions to initialize the CAVI program for the student and resolve any problems that might arise. Otherwise, the student was in sole charge of his/her interaction with the equipment.

As for the other module on "Asking for Help," the same hardware components as described above were used. The difference, however, is that this curriculum was designed for group instruction. Thus, the system was placed in front of the entire group(s) of learners and operated by the teacher.

Goal 2: **Evaluate the effectiveness of the CAVI modules based upon improvement in student performance.**

Objectives 5, 6, 7, 8, and 9. A separate study was conducted to determine the effectiveness of each of the two learning modules. An abbreviation

on each of these two studies is presented below. In both cases, Objectives 5-9 are included.

Study #1

This study was designed to determine whether (1) different types of informational feedback (i.e., error correction) affected learning performance; and (2) interactive video was an effective instructional medium with mildly handicapped adolescents.

Methods and Procedures

Subjects/Groups

Twenty-six mentally handicapped secondary aged students from the 4-J special education program in Eugene, Oregon participated in the study. These Ss were selected from a pool of such individuals who attended, either part or full time, the Magladry Vocational Center and received parental informed consent to engage in the study.

All Ss approved to participate were administered a paper/pencil pretest and selected for inclusion in the study contingent upon their performance. Each student took the budget subtest from the Social and Prevocational Information Battery (SPIB). This standardized subtest consists of 33 true/false items designed to measure knowledge about budgeting. Furthermore, it was selected as a pretest screening device since the learning curriculum focused on budgeting and, in fact, was based on 10 of the 33 items from the subtest.

Subjects were assigned to either Group A (n = 13) or Group B (n = 13). Subject group assignment was based on the pretest scores. In other words,

subjects were rank ordered according to the pretest score and matched into pairs. Subjects from each pair were randomly assigned to either Group A or Group B so that the range of pretest scores was approximately equal in each group. This manner of assigning subjects to groups eliminated pretreatment differences with respect to IQ, age, pretest total score (summation of correct response on the 33-item budgeting subtest), and the pretest partial score (summation of correct responses on the 10 target items). Equality with respect to sex was not achieved via this assignment procedures. Group A contained nine females and four males while Group B was composed of 10 males and 3 females. Table 1 summarizes these group statistics.

Table 1

Means and Standard Deviations of Measures Collected Prior to the Administration of Treatment

Variable	Group A (Experimental)		Group B (Control)	
	x	SD	x	SD
IQ	58.08*	10.07	60.23*	11.63
Age	17.31	1.97	16.23	1.53
Pretest Total Score	18.15	5.01	16.77	4.38
Pretest Partial Score	4.85	1.82	4.62	1.56
Sex (f = 0; m = 1)	.31	.48	.77	.44

*IQ scores were not available for four subjects in Group A nor for three subjects in Group B. In these cases, mean scores were substituted for missing values.

Measures

SPIB total score. The Social and Prevocational Information Battery (SPIB) is a nationally standardized instrument designed specifically for the mildly mentally retarded adolescent. It consists of a series of nine tests that measure knowledge of skills and competencies regarded as important for the independent community adjustment of mentally retarded people. during a test, the administrator reads true/false items as student indicate their answers with paper and pencil.

The subtest used in this study was budgeting, which consists of 33 items with a reported internal reliability of .90. The test was administered twice--the pretest before commencement of the study and the posttest the day after completion of the CAVI treatment.

SPIB Partial Score. This score reflects how well a student performed on a selected 10 items from the full SPIB budgeting subtest. These 10 items closely matched the items taught during the CAVI instruction. The pretest and posttest scores for this measure were gathered from the same SPIB administrations as were the SPIB Total Pretest and Posttest Scores.

Other measures. The other dependent measures reflected how each student performed during CAVI instruction. These other measures were: Errors (total number of incorrect responses), Performance Score (total number of items for which the mastery criterion of two consecutive correct responses was met), and Percentage Learning Score (number of items for which the mastery criterion was met divided by the number of items a student did not initially know). The purpose of this latter score was to provide an index of how much actual learning occurred by controlling for previous knowledge.

A student was considered to have previously known an item if that student answered the item correctly both times during the first two iterations of CAVI instruction.

Learning Module

The content of the CAVI instruction (i.e., learning module) was 10 true/false items drawn from the SPIB budgeting subtest. These items were selected on the basis of moderate to high difficulty (so as to provide enough new content to be learned). Other factors considered in the selection were relevance of the item and the ease with which a true/false item could be converted into a yes/no question. For instance, the true/false SPIB item, "It is always possible to spend your money exactly the way you planned," was converted to "Is it always possible to spend your money exactly the way you planned?" Thus, the items in the learning module were closely aligned with, but not perfectly identical to, the ones in the SPIB Partial Test.

Each student completed the learning module in a single session (25 to 30 minutes). A sample of how a student might proceed through the learning module is depicted in Figure 1. Each item was presented via a narrator on videotape. The student then responded, pressing "Y" on the computer keyboard to indicate yes or pressing "N" for no. The computer evaluated the correctness of each response and then played a video segment of the narrator providing appropriate feedback to the student. Thus, the instructional part of the learning module came from the narrator feedback.

The hypothetical student in Figure 2 (see next page) answered 5 of the 10 CAVI items correctly during the first iteration (i.e., "round") and 7 correctly during the second iteration. Note that the student was required to complete two full iterations of items before any of the items were dropped from the CAVI presentation. Thus, during the first two iterations the student had to respond to 9 other items before responding to a particular item a second time. This procedure attenuated the tendency of students to memorize the correct response for an item.

Mastery criterion was established as a student answering a particular item correctly on two consecutive iterations. Thus, after iterations 1 and 2, the student was no longer presented with items 1, 4, 9, and 10. After four iterations, the student had mastered all items except items 5 and 7. A maximum of three errors was also allowed on any item, which meant the most it could be repeated was six times (i.e., right, wrong 1, right, wrong 2, right, wrong 3). Note that in Figure 2 the student was no longer presented with items 5 and 7 after missing them three times.

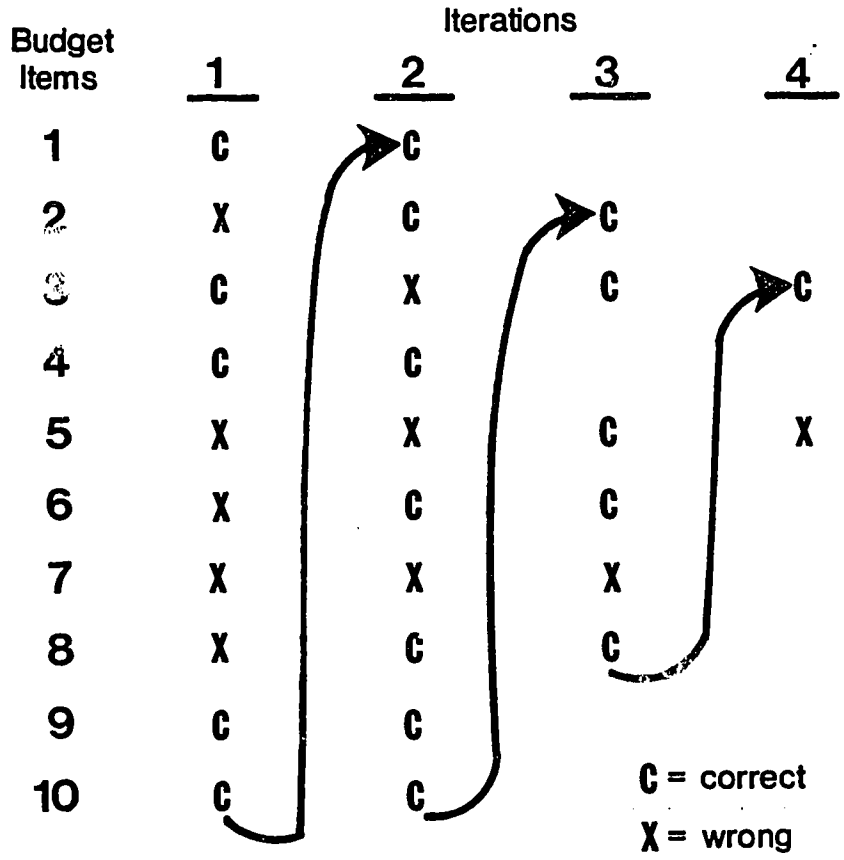


Figure 2. Hypothetical student's performance during CAVI lesson.

Figure 2 reflects a student Error score of 10 (counting up the Xs). The hypothetical student's Performance Score is 8 (mastering 8 of 10 items). The student of Figure 2 has a Percentage Learning Score of .67. (The student is considered to have previously known four items--numbers 1, 4, 9, and 10, as reflected by consecutive correct responses to those items in the first two iterations. Of the remaining 6 items, the student mastered numbers 2, 3, 6, and 8 but not numbers 5 and 7. The student, thus, mastered .67 of the items that were not previously known.)

Groups A and B received identical, brief narrator feedback after <u>correct</u> responses (e.g., "Correct! You pressed no. It is not always possible to spend your money exactly the way you planned.").

The two groups differed only in the narrator feedback they received after <u>incorrect</u> responses. Subjects in Group A received feedback intended to facilitate an understanding of the item and of why the response was incorrect. The first time a Group A subject responded incorrectly to a particular item, the narrator provided a brief correction (e.g., "Wrong! You should have pressed no. It is not always possible to spend your money exactly the way you planned."). The narrator would follow the brief correction with an explanation of the item in conversational language:

> You might have made a very good plan to spend your money but <u>still</u> something might come up that you didn't expect to happen . . . like your TV might stop working and need to be fixed. So then you would change your plan about how to spend your money.

When a Group A student missed that particular item for a second or a subsequent time, even more elaborate feedback was provided. After the brief correction, the narrator would restate the item in simple rule form. The

narrator would then recite a specific example and relate it to the rule. Finally, the narrator would read the original item again and provide a direct answer:

> Here's a rule to remember: Even when you have a good plan for spending your money, it's okay to change your plan when something really important comes up that you didn't expect.
>
> Listen. Sally is planning to spend her extra money on a record album. But, Sally gets a really bad case of poison ivy. It really itches. Sally has to decide . . . to spend her money on the record album or on some ointment that would make the poison ivy itch less.
>
> Should Sally spend her extra money on the ointment? Yes. Why? Because something really important came up that Sally didn't expect. She needs the ointment right away to relieve her pain and itching but she can buy a record album sometime later.
>
> Here's the question again. Is it always possible to spend your money exactly the way you planned? (Pause) No.

Group B students received only the brief form of correction after every one of their mistakes. Because their feedback was shorter, Group B students received less total teaching time than their Group A counterparts but they were able to respond more frequently.

Analysis

The primary research focus was whether the type of feedback that the students received would differentially affect the acquisition through the interactive video medium of the budgeting content. Differences in feedback effectiveness between the two groups were tested for with the *t*-test for independent samples on five measures: (1) number of Errors, (2) Performance Score, (3) Percentage Learning Score, (4) SPIB Total Posttest Score,1 and (5) SPIB Partial Posttest Score.

Another research focus was to determine the effectiveness of the CAVI medium in this particular case (i.e., type of content, type of students, etc.). Effectiveness was determined by the mean Percentage Learning Score for each group. Also, three within-group t-tests for related samples were conducted to examine changes from pre to post treatment: (1) SPIB Total Score (pre to post), (2) SPIB Partial Score (pre to post), and (3) SPIB Partial Pretest Score to Performance Score.

Results

Results on the t-tests to examine differences in feedback effectiveness between Groups A and B are reported in Table 2. No significant differences between the two groups were found for any of the five dependent measures. The largest difference, though still insignificant, was in Errors. Group A averaged almost one more mistake per session than did Group B.

Table 2

Differences in Groups A and B on
Feedback for Error Correction

Variables	N	Mean	SD	t	df	p
Errors						
Group A	13	10.23	5.10	- .38	24	.708
Group B	13	9.38	6.23			
Performance Score						
Group A	13	8.23	1.69	- .11	24	.916
Group B	13	8.15	1.99			
Percentage Learning Score						
Group A	13	.73	.25	.04	24	.965
Group B	13	.72	.29			
SPIB Post Test Partial Score						
Group A	13	6.62	3.07	.07	24	.948
Group B	13	6.69	2.87			
SPIB Post Test Total Score						
Group A	13	20.08	5.35	.10	24	.918
Group B	13	20.31	5.92			

CAVI effectiveness is reflected first in the Percentage Learning Score, which was 73% and 72% for Groups A and B, respectively. That is, on the average subjects in Group A learned four out of 5.8 items not initially known and subjects in Group B learned 3.2 out of 5.1 items not initially known.

Learning effectiveness is also evident in the pre-to-post SPIB test results. Even though subjects in Group A (see Table 3) did not outperform subjects in Group B, their SPIB Partial Pretest to CAVI Performance score showed a large gain from 4.85 to 8.23 (.001 significance). SPIB Total Score showed no significant gains.

Table 3

Group A t-tests for CAVI
Learning Effectiveness

Variables	N	Mean	SD	t	df	p
SPIB Pretest Total	13	18.15	5.01	-1.41	13	.18
SPIB Posttest Total	13	20.08	5.35			
SPIB Pretest Partial	13	4.85	1.82	-1.98	13	.07
SPIB Posttest Partial	13	6.62	3.07			
SPIB Pretest Partial	13	4.85	1.82	-6.30	13	.001
CAVI Performance Score	13	8.23	1.69			

Results for Group B (see Table 4) show that all three comparisons were significant at the .05 level. SPIB Total Score improved from 16.77 to 20.31 (.04 significance), SPIB Partial Scores increased form 4.62 to 6.69 (.02 significance), and the SPIB Partial Pretest Score to CAVI Performance Score improved from 4.62 to 8.15 (.001 significance).

Table 4

Group B t-tests for CAVI Learning Effectiveness

Variables	N	Mean	SD	t	df	p
SPIB Pretest Total	13	16.77	4.38	-2.39	12	.04
SPIB Posttest Total	13	20.31	5.92			
SPIB Pretest Partial	13	4.62	1.56	-2.63	12	.03
SPIB Posttest Partial	13	6.69	2.87			
SPIB Pretest Partial	13	4.62	1.56	-5.47	12	.001
CAVI Performance Score	13	8.15	1.99			

Discussion

The extended incorrect response feedback (Group A) vs. brief incorrect response feedback (Group B) did not show differential effects in learning. A tempting conclusion from this finding is that extensive feedback is no

more effective in CAVI training than simpler (and cheaper to produce) feedback. However, there may be other explanations.

High means and limited variability with the CAVI Performance Scores and SPIB Partial Scores suggest the possibility of a ceiling effect on both of those measures. Thus, there could be true differences between the more extensive vs. briefer feedback types that simply cannot be detected by the existing dependent measures. For instance, because the Group B feedback was shorter, there was a more rapid interchange between narrator and student in Group B. A test of more than 10 items that were more difficult might have uncovered this difference for Group B.

Student gains during the CAVI lesson and on the SPIB tests might be attributable to any number of factors. Students might have used considerable memorization to improve their scores--in which case the extended Group A feedback would be expected to hamper the memorization process. Indeed, on most measures, Group A was outperformed slightly by Group B.

The instructional effectiveness of extended feedback might emerge on content that cannot be memorized. If the SPIB posttest in this study had been a week or even a month afterwards, the ability to score well on the posttest through sheer rote memory would have decreased. Finally, the extended feedback as it was constructed may not have been as effective as another type of extended feedback. Unfortunately, it was not feasible for this study to include any extended feedback using videotaped simulations to dramatize learning points. Simulation feedback might be a powerful form of error correction. Building in the capability for students to respond as a

part of the correction procedure (i.e., feedback) might also increase the effectiveness of the extended feedback.

The results of this study were positive with respect to the potential value of CAVI for the mild to moderate level mentally handicapped adolescent. All students were able to quickly learn the three instructional rules to interact with the CAVI program and were excited about their project involvement. In essence, they were motivated to "work on the computer." One indication of student involvement was the short average response time of 1.2 seconds across all 26 subjects after the computer bell indicated it was ready to accept a response. The teaching facilitator anecdotally confirmed the students' motivation.

The subjects in both groups also showed an improvement in their knowledge acquisition. The improvement was reflected both during the CAVI lesson and from the paper and pencil pre-to-posttest gains. Together, both groups averaged a 72.5% learning gain during the CAVI learning module for items that they did not previously know. Also, all pre-to-posttest gains for both groups on the SPIB (both Total and Partial Scores) were either statistically significant or approaching significance.

In summary, the test results were encouraging for the continued exploration of CAVI as a viable format for teaching mildly mentally handicapped youngsters important knowledge for community adjustment. The University of Oregon Rehabilitation Research and Training Center has since undertaken Project LIVE, an acronym for Learning through Interactive Video Education. The aim of Project LIVE is to develop a set of interactive video curricula to teach mentally handicapped adolescents certain life enhancement skills

through simulated situations. This approach to instruction is intended to aid the successful transition from school to community.

Study #2

The purpose of this study was to pilot test the interactive video curriculum, Asking for Help, that has been developed. The curriculum has been targeted for adolescents and adults who have mild or moderate mental handicaps. Students in this target population participated in the piloting.

Methods and Procedures

Subjects/Groups

Although the Asking for Help curriculum may be used on an individual student basis, it was designed primarily to assist the teacher in small group instruction. The curriculum was tried out on three such groups. Table 5 provides descriptive information on the groups.

Table 5

Subject Characteristics of Three Pilot Test Groups

	Group 1	Group 2	Group 3
Number of Students	13	8	5
Mean Age (years-months)	17-8 (sd=1-5)	16-10 (sd=1-3)	26-0 (sd=5-5)
Mean IQ	64.9 (sd=15.0)	64.1 (sd=8.1)	57.4 (sd=16.0)
Sex	7 males	6 males	2 males

As the table indicates, Group 3 consisted of an older group of students. They worked at an adult workshop that provides retarded citizens with supervised employment. Group 3 subjects were paid to participate in the curriculum at the end of their workday. The adults ranged in age from 20 to 34 and in WISC-R IQ from 42 to 83. One member of Group 3 was a Downs syndrome subject. Another had a history of seizures. The three women and two men had received their "school-age" training and education prior to the passage of P.L. 94-142, which has enhanced educational opportunities for handicapped learners.

The other two groups were students in a Special Education Resource Center at a public high school in a moderately sized, mostly middle class town. The groups represented the same subject population--mildly and moderately handicapped adolescents. However, they attended the Resource Center

at two different peirods during the school day. Group 1 ranged in age from 15 to 20 and in WISC-R IQ from 45 to 88. Respective ranges for Group 2 were 14 to 18 and 52 to 72.

Eight students in Group 1 were considered to experience educable mental retardation (EMR) and two others, trainable mental retardation (TMR). Of the eight EMR students, one had muscular dystrophy, another was orthopedically impaired, and two had speech impairments. One student in Group 1 had a specific learning disability (LD), while another was considered either LD or EMR, with slight visual impairment. A final member of Group 1 was considered nonhandicapped but was experiencing considerable scholastic difficulty. No age and IQ data were available for this student. Seven Group 2 subjects were labeled EMR, and the other was considered possibly EMR or LD.

Measures

A variety of instruments measured student achievement, student reaction, and teacher reaction. Table 6 indicates when the various measures were administered.

Table 6

Schedule for Pilot Measures

Measure	Administration in Relation to Curriculum		
	before	during	after
Curriculum Knowledge Test	X		X
Lesson Answer Sheets		X	
Student Curriculum Questionnaire			X
Teacher Lesson Questionnaire		X	
Teacher Curriculum Questionnaire			X

The first two measures in the table assessed the students' knowledge of and performance in the curriculum. The Knowledge Test was a 54-item true/false measure that is in the process of being psychometrically standardized. The items were closely aligned to the learning points for students in the curriculum. The pre-to-posttest change in Knowledge Test scores was an indication of the effect of the curriculum on students. This test was administered just before, and the day after, completion of the curriculum. Also, the marked Lesson Answer Sheets of the individual students reflected the difficulty level for subjects of the 29 curriculum items.

Both students and teachers had an opportunity to express their reactions after the unit via a curriculum questionnaire. The teachers' questionnaire contained 20 questions, the students' five questions. Also, the

teachers shared reflections via a lesson-by-lesson questionnaire that probed student attention, student enjoyment, student interaction, fidelity of implementation (how carefully teachers followed the teachers manual), lesson time length, and hardware operating difficulties.

Learning Module

Students were not taught by their regular teachers or supervisors but rather by a staff member in the University of Oregon College of Education with considerable experience as a special education teacher, who was also familiar with the Asking for Help curriculum. All three groups completed the 8-lesson curriculum within 10 consecutive workdays. Each session lasted approximately one hour. Lessons 1 and 4 required less than one session of teaching, while Lessons 2 and 3 required more than one session.

The curriculum focused on the areas of why ask for help (Lesson 1), when to ask for help (Lessons 2, 3), who to ask for help (Lesson 4), in what situations to ask for help (Lessons 5, 6, 7), and how to ask for help (Lesson 8). In all, the lessons introduced 46 learning points to the students--such as "When a problem will get worse if you ignore it, ask for help soon."

The 8 lessons were shown on a total of 3 hours and 10 minutes of videotape. However, the lessons required much more total time than that, due to the branching capabilities of these computer lessons and to the abundant opportunities for interaciton that were afforded the students. The students encountered, during the 8 lessons, at least (probably more, due to branching) 29 interactive opportunities to mark responses on paper-pencil answer sheets to multiple-choice items, 29 opportunities to indicate their answers

by pressing the computer keyboard, 68 opportunities to discuss issues and situations, 67 opportunities to verbally rehearse learning points, and 7 opportunities to role play situations related to requestion assistance.

Results

Table 7 contains the pre- and posttest Knowledge Test results for the groups. Group 3 subjects benefited most from the curriculum, with an average gain of 5 points. Overall, the pre- to posttest improvement for the 25 subjects was statistically significant at the .01 level (t = 3.54, df = 24). The overall improvement also translates to an effect size of 0.48 (Glass, McGaw, & Smith, 1981). If the pretest scores are representative of the typical knowledge about requesting assistance of a population for whom the curriculum is targeted, then an effect of this size means that the curriculum brought about a move for the 25 individuals from the 50th to the 68th percentile within the population.

Table 7

Knowledge Test Means and Standard Deviations

		Pretest		Posttest	
	N	Mean	SD	Mean	SD
Group 1	13	22.0	5.7	24.6	5.9
Group 2	7	21.0	5.6	22.3	3.5
Group 3	5	16.2	3.7	21.2	6.3
Overall	25	20.6	5.6	23.3	5.4

In all, 19 of 25 students gained from pre- to posttest scores. This corresponds to a p value of .007 according to the binomial test.

The experimental teachers' responses to the Teacher Lesson Questionnaire indicated that Group 3 was more attentive to Asking for Help than the other group but that all groups were very attentive for, and greatly enjoyed, most lessons. According to the teacher, students interacted with one another "somewhat" during most lessons (and "very much" during others). Because the experimental teacher was fairly directive, a "somewhat" rating in this category is preferable to "very much." Also, the teacher indicated that she discussed and verbally rehearsed the curriculum's learning points less frequently in later lessons than in earlier ones.

Three teachers filled out the Teacher Curriculum Questionnaire--the experimental teacher, as well as the regular Special Education teachers of Groups 1 and 2 (who were observing the piloting). All teachers indicated that they liked the content focus of Asking for Help and that it was enjoyable and relevant for the students. They indicated that the curriculum, on the videotape and in the teachers' manual, clearly presented main points and that it was easy to use. Teacher responses indicated that Group 3 probably found Asking for Help more difficult than the other groups did.

The high school students, via the Student Curriculum Questionnaire, indicated their reactions to Asking for Help. Eighty percent found the lessons easy (as opposed to hard), 65% enjoyed the lessons "a lot," 80% thought the information in the lessons was new, and 70% would look forward to more lessons "like these."

Discussion

One noticeable result was that different types of students benefited from the curriculum. Both mildly handicapped adolescents and more moderately handicapped adults showed improvement on the Knowledge Test. It could be that the content choice of the curriculum is useful to a heterogeneous mix of students. Students who bring varying levels of preskills to the Asking for Help curriculum might benefit in different ways. Most students, especially relatively low performers, probably become more aware that requesting assistance can enhance their lives. And, higher performers can also benefit from the specific, detailed learning points. Situations about requesting assistance seem to engage practically all students, irrespective of level (unlike exercises such as math problems, which require definite prerequisite abilities).

Future try-outs might reveal that the Asking for Help curriculum can be used suitably for even younger mildly handicapped students, as well as for young nonhandicapped students.

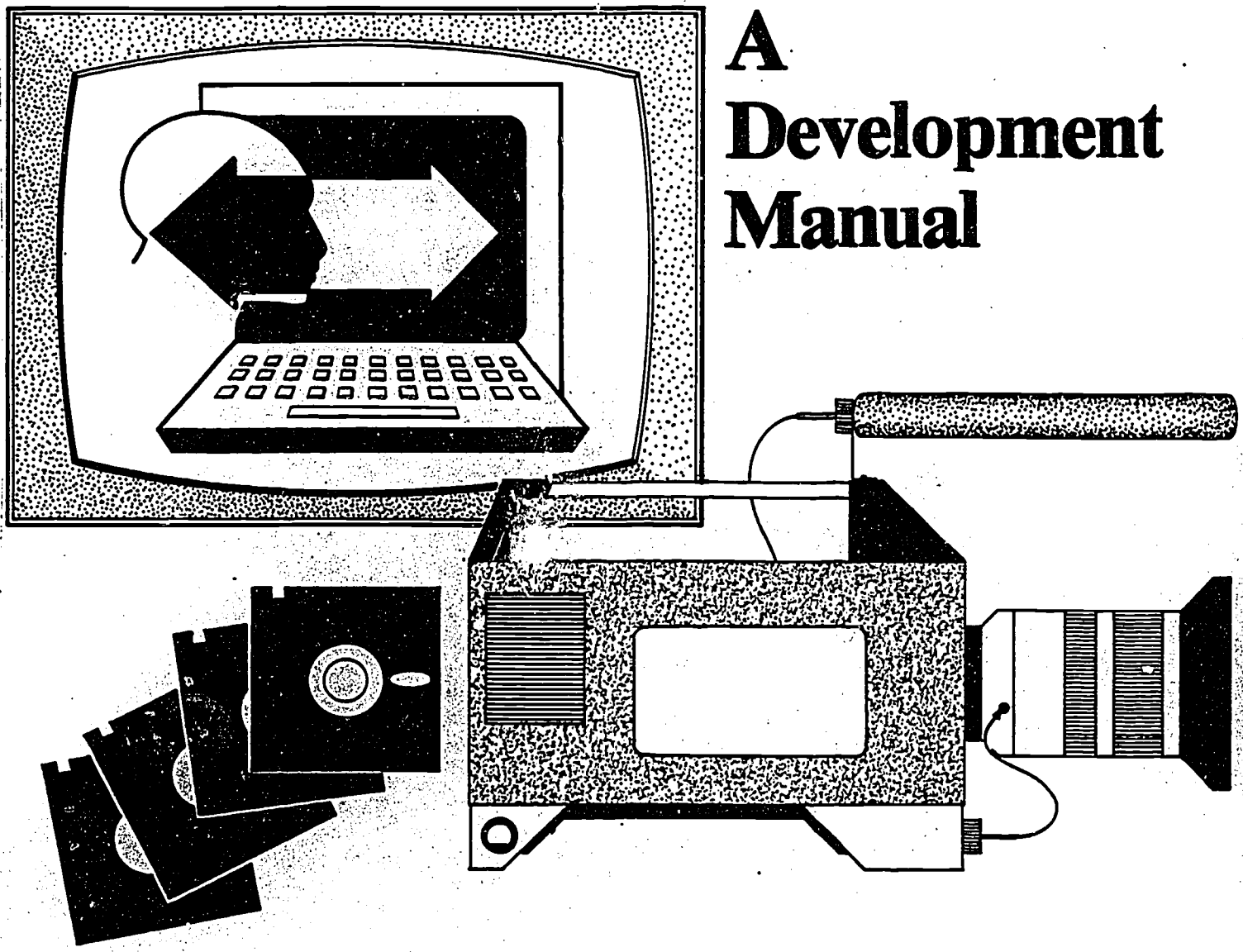
Goal 3: **Prepare and disseminate products to further enhance the utility of this instructional technology for teaching transitional living skills.**

Objective 10. A 68-page CAVI or Interactive Video Development Manual has been completed and is published by and distributed through the International Council for Computers in Education. Presented on the following two pages is the cover of this manual and the Table of Contents. This resource on "how to" develop Interactive Courseware especially for special needs

students will be distributed to a wide range of potentially interested persons in the subject area. Furthermore, it will be made known through a variety of clearinghouses such as ERIC, LINC, and ABLEDATA.

Interactive Video in Special and General Education:

A Development Manual



ICEE Publications

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Table of Contents

Objective 11. In addition to the Interactive Video Development Manual briefly described in the previous section, two manuscripts have been prepared, submitted, and accepted as articles to be published in forthcoming editions of journals. Articles 1 and 2 below represent studies 1 and 2, respectively.

-- Carter, J., Browning, P., Nave, G., & White, W. A. T. (in press). Interactive video as a learning medium for mildly handicapped adolescents. Journal of Special Education Technology.

-- Browning, P., Barkin, P., White, W. A. T., & Nave, G. (in press). Teaching handicapped learners through interactive video. The Computing Teacher.

In addition to the above manuscripts, a number of professional presentations were made on the activities related to this project. Each of these presentations is listed below:

"A New Instructional Technology to Enhance Transition from School to Community for Mildly Handicapped Individuals." The Council for Exceptional Children's National Conference on Technology in Special Education; Reno, Nevada; January 27, 1984.

"Interactive Video Activities for the Mentally Handicapped." Statewide Symposium on Sharing Resources and Ideas for Developing Computer Assisted Video Instruction; Corvallis, Oregon; February 17, 1984.

"Learning by Interactive Video Education." Western Regional Technology Conference sponsored by the University of Oregon Resource Center in Special Education; South Lake Tahoe, California; July 30, 1984.

"Interactive Video and the Mentally Handicapped: A Research and Demonstration Program." Third Annual Computer Conference in Education sponsored by the Center for Advanced Technology in Education; Eugene, Oregon; University of Oregon; August 2, 1984.

"Learning through Interactive Video Education: A Project to Teach Community Adjustment Skills to Mildly Mentally Handicapped Individuals." A Conference on Computer Technology for

the Handicapped sponsored by Closing t he Gap; Minneapolis, Minnesota; September 15, 1984.

"A Training Program or Interactive Video with Mentally Handicapped Learners." The Annual Oregon Conference for Special Educators; Eugene, Oregon; University of Oregon; February 15, 1985.

"Interactive Video in Special Education." The Northwest Council for Computers in Education; Eugene, Oregon; February 8, 1985.

"Interactive Video: A Instructional Approach with Handicapped Learners." An annual conference entitled Promising Practices and Technology for Developing Futures for the Handicapped and sponsored by the Oregon Department of Education; Salem, Oregon; March 7, 1985.

Objective 12. As indicated in the proposal, the software developed for the project is available for anyone interested in pursuing it to conduct further research in the area of Interactive Video as an instructional technology for handicapped learners.

References

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